In the Drawings:

The appended drawing sheets include replacement sheets for FIGS. 3, 6 and 7, which have been amended to include labels in response to the drawings objection.

Appendix: Three (3) Replacement Sheets.

REMARKS

Claims 1-5, 8-12, 15, 18, 19 and 28-30 have been amended. Claim 7 has been canceled. No new matter has been added. Upon entry of this amendment, claims 1-5, 8-16, 18-20 and 28-31 will be pending in this application.

FIGS. 3, 6 and 7 are objected to for illustrating block elements without labels. FIGS. 3, 6 and 7 have been amended in response to this objection as explained in the Amendments to the Drawings section. Accordingly, withdrawal of the objection to the drawings is respectfully requested.

Claims 28 and 29 are rejected under 35 USC 112, second paragraph, as being unclear as to whether the limitations following the phrase "such that" are part of the claimed invention. To simplify the claim language, claims 28 and 29 have been amended to remove these limitations. Accordingly, withdrawal of the rejection under 35 USC 112, second paragraph, is respectfully requested.

Applicants thank Examiners Paul and Ro for the courtesies extended to Applicants' representative during the telephonic interview on July 16, 2009. During the interview, Applicants' representative discussed the present invention in the context of Kaplan (US 6,819,008) and Ookawa (US 5,796,226). In particular, Applicants' representative explained how Kaplan and Ookawa fail to disclose or suggest the same predetermined angle correction factor being determined or applied to a portion of an advance angle profile covering a range of different speeds as embodied in the present invention. The Examiners appeared to appreciate this difference between the present invention and Kaplan and Ookawa, and recommended that the claims be amended to further define this aspect of the invention and to include more structural language. Accordingly, the claims have been amended in accordance with the Examiners' comments. In particular, claim 9 has been amended to clarify a method in which the single angle correction factor is determined, and claim 1 has been amended to clarify a controller configured to use the single predetermined angle correction factor.

As a matter of background, the present invention pertains to a switched reluctance motor. A controller of a switched reluctance motor can store a map of angles (e.g., turn-on, turn-off and/or conduction angles) for a range of different speeds. In response to a signal indicative of motor speed, the controller can select the corresponding angles and use the selected angles to control the excitation of the winding.

The map can be written to the controller at time of manufacture and remain fixed throughout the lifetime of the motor. Unfortunately, owing to manufacturing tolerances, not every motor coming off the assembly line turns out the same. As a result, the performance of each motor may vary quite markedly.

One way to solve this problem can be to employ high-precision manufacturing such that the tolerances are relatively tight. However, high precision manufacturing significantly increases the cost of the motor. An alternative solution can be to generate a different map for each and every motor. This can involve measuring the input power of the motor at a particular speed, comparing the measured input power against an ideal value, adjusting the corresponding angles until the measured input power corresponds to the ideal value, and storing the adjusted angles to the map. This process can then be repeated for each speed within the map. As can be appreciated, this solution can be time consuming and costly. Both of these solutions are discussed in paragraph [0027] of the published application.

The present invention provides a solution that is both quicker and cheaper than the above solutions. For example, following manufacture, the same nominal map can be written to the controller of each and every motor. This nominal map, when employed with a nominal motor, can result in an ideal power profile (e.g. FIG. 4 of the published application). Each motor can then be fine tuned using an external test controller. The test controller can drive each motor at a particular speed (e.g. 80 krpm) using the corresponding angles from the nominal map. The test controller can then measure the input power of the motor and compare the measured power against the ideal input power at that speed. If there is a difference between the measured input power and the ideal input power, the test controller can incrementally adjust one or more of the

corresponding angles until the measured power and the ideal power are substantially the same. At this point, the test controller can write the angle adjustment to the controller of the motor as a correction factor. The controller of each motor can thus store a nominal map that is common to all motors, and a correction factor that is unique to each motor. See, for example, paragraphs [0034] – [0037] of the published application.

When the motor is running at speed, the controller can select from the nominal map angles corresponding to the speed of the motor. The controller can then apply the correction factor to one or more of the selected angles. The selected angles can then be used by the controller to excite the winding. In particular, the same correction factor can be used irrespective of the speed of the motor over a range of difference rotor speeds. As can be appreciated, when the motor is running at 80 krpm (e.g., the speed at which the motor is fine tuned), the input power is the same as the ideal input power. However, the inventors appreciated that the input power can be largely the same as the ideal input power at other speeds. Consequently, a single correction factor applied to the selected angles provides a good approximation to a map that has been fully optimized for that motor.

Thus, the present invention has the advantage of providing a controller that compensates for tolerances in the motor through the use of a common map and a single correction factor. The performance of the motor can therefore be improved in manner that is quicker and cheaper than generating a full map.

Claims 1-5, 7, 9, 10-12, 14-16, 18, 19 and 28-31 are rejected under 35 U.S.C. 102(b) on Kaplan. Claims 8 and 13 are rejected under 35 USC 103(a) on Kaplan. Claim 20 is rejected under 35 USC 103(a) on Kaplan in view of Elliot. These rejections are respectfully traversed with respect to the claims as amended.

Amended claim 1 recites a controller of an electrical machine having a rotor and at least one electrically energisable phase winding. The controller is configured to apply a single predetermined angle correction factor to a portion of a predetermined advance angle profile

covering a range of different rotor speeds. Claims 8 and 18-20 incorporate similar recitations. This aspect of the claimed invention is neither disclosed nor suggested by Kaplan.

Kaplan discloses a controller for a switched reluctance generator. However, in contrast to the claimed invention in which a controller is configured to apply a *single* angle correction factor to an advance angle profile covering a *range* of *different rotor speeds*, the controller of Kaplan is configured to apply *different* correction factors that inevitably *vary* with speed. This is due to the controller of Kaplan being configured to use a feedback loop to compare the output power of the generator with a reference power level. In response to the comparison, the feedback loop calculates a correction factor that is proportional to the difference between the measured output power and the reference power level. See Kaplan, col. 8, line 19 – col. 9, line 5.

Further, because the controller of Kaplan applies a correction factor that is *determined on-the-fly* using the feedback loop, Kaplan does not disclose a controller configured to apply a *predetermined* angle correction factor to an advance angle profile as claimed.

Accordingly, because Kaplan does not disclose or suggest all of the elements required by claims 1, 8 and 18-20, and the deficiencies of Kaplan are not compensated for by the additional cited reference of Elliot, the rejections under 35 USC 102(b) and 35 USC 103(a) of claims 1-5, 8, 18-20 and 28-30 should be withdrawn.

Amended claim 9 recites a method of generating a control map for a controller of a machine having a rotor and at least one electrically energisable phase winding. The method includes producing a single angle correction factor for a portion of an advance angle profile covering a range of different rotor speeds. Claim 16 incorporates similar recitations. This aspect of the claimed invention is neither disclosed nor suggested by Kaplan.

As described above, Kaplan calculates *different* correction factors that inevitably *vary* with speed. There is no disclosure is Kaplan of producing a *single* angle correction factor for a portion of an advance angle profile covering a *range* of *different rotor speeds* as claimed.

Accordingly, because Kaplan does not disclose or suggest all of the elements required by claims 9 and 16, the rejections under 35 USC 102(b) and 35 USC 103(a) of claims 9, 10-13, 14-16 and 31 should be withdrawn.

Claims 1-5, 7-16, 18, 19, 20, 28, 29, 30 and 31 are rejected under 35 U.S.C. 103(a) on Ookawa in view of Kaplan. This rejection is respectfully traversed with respect to the claims as amended.

With respect to claims 1, 8 and 18-20, Ookawa also fails to disclose or suggest a controller configured to apply a *single* angle correction factor to an advance angle profile covering a *range* of *different rotor speeds* as recited in claim 1. Rather, the microcomputer of Ookawa is configured to apply *different* correction factors that *vary* with speed. This is due to the microcomputer of Ookawa being configured to utilize the equations that vary with speed. In particular, each standard turn-off angle in Ookawa is corrected by an advance value, and the result is stored in the map as a turn-off angle. See, for example, Ookawa, col. 15, lines 34-41. The advance value is provided by the equations at col. 16, lines 11 and 16. The first equation is used when the motor speed is in excel of Rbase, and the second equation is used when the motor speed is less than or equal to Rbase. Consequently, the advance value used to correct each turn-off angle varies with both speed and torque. Accordingly, because each turn-off angle in Ookawa is corrected by a different amount that varies with both speed and torque, Ookawa provides no disclosure of a controller applying a *single* angle correction factor to an advance angle profile covering a *range* of *different rotor speeds* as claimed.

Further, because the microcomputer of Ookawa corrects the standard turn-off angles using the equations provided at col. 16, lines 11 and 16 *on-the-fly*, Ookawa does not disclose a controller configured to apply a *predetermined* angle correction factor to an advance angle profile as claimed.

Accordingly, because Ookawa does not disclose or suggest all of the elements required by claims 1, 8 and 18-20, and the deficiencies of Ookawa are not compensated for by the

additional cited reference of Kaplan, the rejection under 35 USC 103(a) of claims 1-5, 8, 18, 19, 20, 28, 29 and 30 should be withdrawn.

With respect to claims 9 and 16, Ookawa also fails to disclose or suggest producing a *single* angle correction factor for a portion of an advance angle profile covering a *range* of *different rotor speeds* as claimed. As described above, Ookawa calculates *different* correction factors that *vary* with speed. There is no disclosure is Ookawa of producing a *single* angle correction factor for a portion of an advance angle profile covering a *range* of *different rotor speeds* as claimed.

Accordingly, because Ookawa does not disclose or suggest all of the elements required by claims 9 and 16, the rejection under 35 USC 103(a) of claims 9-16 and 31 should be withdrawn.

In view of the above, early action allowing claims 1-5, 8-16, 18-20 and 28-31 is solicited.

In the event the Patent and Trademark Office determines that an extension and/or other relief is required, Applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 424662013300.

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Respectfully submitted,

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Attachment

APPENDIX